

# ASSESSMENT OF THE LINK BETWEEN MACROECONOMIC DEVELOPMENT INDICATORS AND TAX REVENUES OF THE COUNTRY

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**Abstract.** *In any country, the tax system acts as the basis of the economic system. In Poland, the process of improving the tax system is constantly underway. It is aimed at unification with world norms and standards and depends on the strategic directions of the national economic development. Since the opportunities for implementation of the country's strategic development programmes depend on the level of the state income and the main indicators of national development are macroeconomic indicators, the purpose of the paper is to study the relationship between the dynamics of macroeconomic indicators and tax revenues of the country. In the research study there were used some general scientific and special methods, such as: systematic method (in the research study of taxes in the structure of budget revenues); comparison, grouping, analysis and synthesis, statistical method (in analysing the dynamics of macroeconomic indicators and the volume of tax revenues in the budget of Poland); method of logical generalisation (for the formation of conclusions). The research used data exclusively from the official statistical sources of the Main Statistics Office of Poland, the National Bank of Poland, the Ministry of Finance of Poland. The paper identifies the importance of tax revenues in the revenue part of the budget, analyzes the growth rates of taxes and macroeconomic indicators, establishes a correlation and a regression relationship between gross domestic product, public debt, balance of trade, volume of gold reserves and total tax revenues, and also outlines the level of efficiency of the Polish tax system on the basis of the coefficient of tax elasticity. The results of the research study showed that tax revenues are sensitive to changes in the growth of gross domestic product, as well as changes in public debt, exports and imports, gold and foreign exchange reserves. All the above should take into account the country while being in the budget planning and forecasting process.*

**Keywords:** domestic product, exports, foreign exchange reserves, import, public debt.

## Introduction

Taxes are the financial basis for the country's functioning. They provide the most part of budget revenues, mobilise cash resources to finance public expenditures and serve as a guiding financial indicator in the budget planning and forecasting process. In today's conditions of a market economy, taxes play an important role in ensuring the financial stability of the country and in achieving social welfare of citizens. Since they are an objective social phenomenon, the

compliance of the tax system is extremely important in the formation of a favourable environment for the development of the country. Under dynamic changes and instability in economic situation in Poland, a special significance acquires such a system of tax administration, which would meet the needs of socio-economic development of the country, ensured the reduction of tax burden, initiated the revival of business activity, stimulated investment and innovation activities and encouraged taxpayers to fully pay their taxes in a timely manner. Besides, special attention should be paid to the process of ensuring a proper level of tax revenues, taking into account macroeconomic indicators. Scientific approaches to forecasting budget revenues, tax bases and peculiarities of tax administration are highlighted in the works of scholars of the Polish economic thought: L. Bylicki, S. Dolata, S. Owsiak, R. Goryszewski, E. Kotowska, M. Sosnowski, W. Ziółkowska. Despite the fact that in scientific works there were researched the theoretical and applied aspects of the taxation system (Bylicki, 2016; Dolata, 2009; Owsiak, 2005; Sosnowski, 2016), the process of budget forecasting and planning (Goryszewski & Kotowska, 2015), the issue of assessing the dynamics of macroeconomic indicators and the volume of tax revenues to the state budget remains inadequately investigated. Accordingly, the purpose of the paper is to study the relationship between the dynamics of macroeconomic indicators and tax revenues of the country. In the research study there were used some general scientific and special methods, such as: systematic method (in the research study of taxes in the structure of budget revenues); comparison, grouping, analysis and synthesis, statistical method (in analysing the dynamics of macroeconomic indicators and the volume of tax revenues in the budget of Poland); method of logical generalisation (for the formation of conclusions). Database of research study consisted of data from the Main Directorate of Statistics of Poland, the National Bank of Poland, the Ministry of Finance of Poland, monographs and scientific papers in periodicals.

### **Tax revenues in the state budget of Poland**

Tax revenues are mandatory payments that come to the budget as a result of the compliance with the tax law by the payers (Owsiak, 2005: 173). They occupy an important place in the budget revenues, occupy the largest share in the structure of budget revenues, which, in turn, affects the socio-economic development of the state, and is also one of the tools of state regulation of the economy. The formation of tax revenues is the process of initiating, administering and accumulating taxes with the use of fiscal pressure.

Tax revenues of the budget, their formation, distribution and use are an important element of fiscal and tax regulation of the economy, the value of which increases in the conditions of the market economy system. The state's influence

on the development of economic processes becomes indirect and is realized through the implementation of economic, including budget and tax policies, the consistency and weight of which determine the rates of economic growth (Ziółkowska, 2005: 86). The state can expand its existing obligations only if sources of tax revenues are used from the country's budget.

Income tax revenues are an important form of redistribution of GDP (gross domestic product). They provide a significant portion of state budget revenues.

The volume of tax revenues is determined by the state of the country's economy, the number of economic agents and their activity, which, accordingly, are obliged to deduct in favour of the state in accordance with the provisions of the national tax legislation and the state's requirements regarding financial support for the implementation of state programmes. The formation of tax revenues by the state is carried out by removing part of the income or other assets of taxpayers.

Let us determine the place of tax revenues in the revenues of the budget of the Polish state through an analysis, which is presented in Table 1.

**Table 1 Structure of state budget revenues of the Polish state for 2000 - 2016 years**  
(Author's calculations based on data from the Statistical Yearbooks of the Republic of Poland in Years 2012 - 2017)

Years	Indicators					
	Tax revenues		Non-tax revenues		Other revenues	
	mln. PLN	%	mln. PLN	%	mln. PLN	%
2000	119 644	88.2	16 020	11.8	-	-
2001	119 101	84.8	21 426	15.2	-	-
2002	128 751	89.7	14 769	10.3	-	-
2003	135 228	88.9	16 883	11.1	-	-
2004	135 571	86.7	18 122	11.6	2 588	1.7
2005	155 860	86.7	21 465	11.9	2 477	1.4
2006	174 876	88.5	20 779	10.5	1 985	1.0
2007	206 385	87.3	22 448	9.5	7 534	3.2
2008	219 499	86.6	19 309	7.6	14 739	5.8
2009	214 879	78.4	27 433	10.0	31 871	11.6
2010	222 533	88.9	24 502	9.8	3 248	1.3
2011	243 211	87.6	32 274	11.6	2 072	0.8
2012	248 275	86.3	37 143	12.9	2 177	0.8
2013	241 651	86.6	35 976	12.9	1 524	0.8
2014	254 781	89.9	27 232	9.6	15 301	0.5
2015	259 674	89.8	27 710	9.6	1 753	0.6
2016	273 138	86.8	40 131	12.8	1 414	0.4

From the data in Table 1, it can be seen that tax revenues accounted for about 90 % of Poland's state budget revenues in recent years. Thus, in 2014, tax revenues

accounted for 89.9 % of budget revenues, which amounted to PLN 254 781 million, in 2015 this figure was 89.8 %, that is, PLN 259 674 million, and in 2016 – 86.8 %, that is, PLN 273 138 million. These figures indicate that the role of tax payments is significant, since the effectiveness of the state's performance and the welfare of the society depends on the amount of taxes paid. It is clear from the calculations that during the period from 2000 to 2016 there was an increase in the volume of tax revenues to the budget of the country. Thus, the amount of tax payments in 2016 compared with 2000 increased by PLN 153 494 million.

The factors that influence the volume of tax revenues to the budget include macroeconomic factors that change with each passing year (Dolata, 2009: 28): GDP, balance of payments structure, legislative base. In addition, the volume of tax revenues in the budget is also influenced by microeconomic factors: the choice of enterprises for the form of their taxation, the presence of enterprises tax breaks, the level of profitability of economic entities, their gross income, labour costs in the structure of the cost of production of the enterprise, the average number of people working.

The volume of tax revenues of the budget is determined by the tax policy of the state, since taxes are a factor affecting the economic activity of enterprises, the state, they can change the structure of the activity of individual enterprises, the structure of economic sectors, structure of the national economy. In particular, taxes can be used to equalize incomes and ensuring a certain level of social equality, to promote job creation through the preferences of small business and individual entrepreneurship, to be a tool to curb inflation, and be an instrument of export-import relations.

The system of tax revenues to the central budget of the Polish state includes (Owsiak, 2005: 176):

- indirect taxes: a tax on goods and services, excise tax, gaming,
- direct taxes: income tax of legal persons, income tax on individuals,
- other income taxes.

The next part of the article will analyse the connection of direct and indirect taxes and macroeconomic indicators, namely: gross domestic product, foreign exchange reserves, balance of exports and imports, public debt.

### **Macroeconomic indicators and tax revenues to the budget of the Polish state in 2010 – 2016**

One of the main macroeconomic indicators that characterize the results of the country's economic development is gross domestic product (GDP). In order to understand the features of the relationship of GDP with tax revenues, it is

necessary to analyse their volume changes, which will enable us to estimate the relationship between the indicators (Table 2).

**Table 2 Dynamics of GDP by categories of tax revenues of the Polish state budget for 2010-2015** (Author's calculations based on data from the Statistical Yearbooks of the Republic of Poland in Years 2012 - 2017)

Indicators	Years, in mln. PLN					
	2010	2011	2012	2013	2014	2015
<i>Gross domestic product</i>	1445297	1553582	1615894	1656341	1719704	1798302
Costs related to employment	547 676	573 441	598 549	618 838	646 459	664 449
Taxes reduced by subsidies on production and import	178 639	192 108	188 974	186 617	195 836	208 398
Gross operating surplus	718 982	788 033	828 371	850 886	877 409	925 455
<i>Tax revenues</i>	222 553	243 211	248 275	241 651	254 781	259 674
Indirect taxes, including:	165 190	180 273	181 892	175 369	187 067	187 267
tax on goods and services	107 880	120 832	120 001	113 412	124 262	123 121
excise tax	55 684	57 964	60 450	60 653	61 570	62 809
tax on games of chance and betting	1 625	1 477	1 442	1 304	1 235	1 337
Income tax, including:	57 363	62 937	64 955	64 366	66 288	70 853
corporate tax	21 770	24 862	25 146	23 075	23 266	25 813
income tax from individuals	35 593	38 075	39 809	41 291	43 022	45 040
Growth rate compared with the previous year, %						
<i>Gross domestic product</i>		7.49	4.01	2.50	3.83	4.57
Costs related to employment		4.70	4.38	3.39	4.46	2.78
Taxes reduced by subsidies on production and import		7.54	-1.63	-1.25	4.94	6.41
Gross operating surplus		9.60	5.12	2.72	3.12	5.48
<i>Tax revenues</i>		9.28	2.08	-2.67	5.43	1.92
Indirect taxes, including:		9.13	0.89	-3.58	6.67	0.11
tax on goods and services		12.01	-0.68	-5.49	9.57	-0.92
excise tax		4.09	4.29	0.34	1.51	2.01

tax on games of chance and betting		-9.11	-2.37	-9.57	-5.29	8.26
Income tax, including:		9.72	3.21	-0.91	2.99	6.89
corporate tax	-	14.20	1.14	-8.24	0.83	10.95
income tax from individuals	-	6.97	4.55	3.72	4.19	4.69

From Table 2, it can be seen that, with an increase in GDP, the tax revenue of the state budget increases as well. This is explained by the fact that with the growth of the corresponding component of the macroeconomic indicator the volume of the corresponding tax increases. Analysing data for the period 2010 - 2015, one can see that GDP increased from PLN 1 445 297 million in 2010 to PLN 1 798 202 million in 2015, i.e. by PLN 353 005 million, or by 24.42 %, respectively the tax revenues of the state budget increased from PLN 222 533 million in 2010 to PLN 259 674 million in 2015, i.e. by PLN 37 141 million, or by 16.69 %. It is necessary to draw attention to the fact that in 2011 and 2014 the growth rate of tax revenues to the budget was higher than the growth rate of GDP. In particular, in 2011 GDP growth by 7.49 % affected the growth of tax revenues to the country's budget by 9.28 %, while in 2014 GDP growth by 3.83 % led to an increase in taxes to the budget by 5.43 %. However, in 2012 and 2015, the GDP growth rate in Poland was higher than the growth rate of tax revenues to the budget. Thus, in 2012, the GDP growth rate amounted to 4.1 %, which led to an increase in tax revenues to the state budget by 2.08 %, and in 2015, GDP growth caused an increase in taxes to the budget by only 1.92 %. However, in 2013 GDP growth at 2.50 % led to a reduction in taxes of 2.67 %. The latter was caused by a decrease in value added tax of PLN 6 589 million (5.49 %), a gambling tax of PLN 132 million (9.57 %), a corporate income tax of PLN 2 071 million (8.24 %). The scientific financial literature points to various factors that cause similar situations, for example, the political situation in the country, changes in the tax legislation of the country, etc.

Another major macroeconomic indicator that characterizes the results of economic development in the country is the volume of Poland's gold and foreign exchange reserves (Table 3).

**Table 3 Volumes of gold and foreign exchange reserves of Poland for 2010 -2015, mln USD** (Author's calculations based on data from the Statistical Yearbooks of the Republic of Poland in Years 2012 - 2017)

Indicators	Years, in mln USD					
	2010	2011	2012	2013	2014	2015
Official Reserve Assets	93514,4	97866,0	108914,6	106219,5	100438,2	94921,1
1. Monetary gold	4 666,4	5 209,9	5 506,0	3 975,7	9 968,6	3 515,3
2. SDR	2 018,7	1 796,8	1 731,6	1 635,5	1 429,0	1 312,6
3. IMF reserve position	500,9	1 160,3	1 349,2	1 260,5	966,2	662,2
4. Receivables in convertible currencies	86328,4	89699,0	100327,8	99 347,8	94 074,4	89431,0
Growth rate compared with the previous year, %						
Official Reserve Assets		4.65	11.29	-2.47	-5.44	-5.49
1. Monetary gold		11.65	5.68	-27.79	-0.18	-11.42
2. SDR		-10.99	-3.62	-5.55	-12.63	-8.15
3. IMF reserve position		131.64	16.28	-6.57	-23.35	-31.46
4. Receivables in convertible currencies		3.90	11.85	-0.98	-5.31	-4.94

If we analyse the growth rates of Poland's gold and foreign exchange reserves and compare them with the growth rates of tax revenues, one can see that in 2011-2012 the increase of the country's gold and foreign exchange reserves by 4.65 % (2011) and 11.29 % (2012) led to the growth of taxes to the budget, respectively, at 9.28 % and 2.08 %. However, in 2013 the reduction of the volume of gold and foreign exchange reserves by 2.47 % led to a reduction of tax revenues to the state budget by 2.67 %; and in 2014 and 2015, the decrease of gold and foreign exchange reserves by 5.44 % (2014) and 5.49 % (2015) caused the growth of tax revenues of the budget, respectively, by 5.43 % and 1.93 %.

Also, macroeconomic indicators that characterize the economic development in the country are the volume of export and import of goods, as well as the level of public debt (Table 4).

**Table 4 Volume of export and import of goods, the level of public debt of Poland for 2010 - 2015, million PLN** (Author's calculations based on data from the Statistical Yearbooks of the Republic of Poland in Years 2012 - 2017)

Indicators	Years, in mln PLN					
	2010	2011	2012	2013	2014	2015
Exports	481 058	558 739	603 419	647 879	693 472	750 836
Imports	536 221	623 373	648 128	656 098	704 568	740 973
Balance	-55 163	-64 634	-44 709	- 8 219	-11 096	9 863
Public debt	747 899	815 343	840 477	882 293	826 775	877 282
Growth rate compared with the previous year, %						
Exports		16.15	7.99	7.37	7.04	8.27
Imports		16.25	3.97	1.23	7.39	5.17
Balance		-17.17	-30.83	-81.62	35.00	-188.89
Public debt		9.02	3.08	4.98	-6.29	6.11

The data of the analysed period show that the volume of export and import of goods in Poland has increased. In particular, for the period from 2010 to 2015, exports of goods increased by PLN 269.178 million, or by 56.08 %, and imports - by PLN 204 752 million, or by 5.17 %. In 2015, the balance of exports and imports of goods was positive and amounted to PLN 9 863 million. This shows positive trends in Poland's foreign trade policy. However, the growth rate of exports and imports of goods decreased from 2010 to 2015.

The statistical data on the total amount of public debt show variable dynamics: during the period under review, the total debt increased from PLN 747,899 million in 2010 to PLN 877,282 million in 2015, i.e. by PLN 129 383 million, or by 17.29 %. However, the growth rate of government debt for the analysed 2010-2015 years declined annually.

For a better understanding of what level of influence have the above-mentioned macroeconomic indicators on the amount of tax revenues to the state budget, we will use the coefficient of elasticity of taxes, which shows how the volume of tax revenues changes to the budget depending on the change in the volume of a certain macroeconomic indicator.

For example, derived from the effect of GDP change, the formula for the coefficient of tax elasticity is as follows:

$$Ce = \frac{\Delta Tr}{\Delta GDP} \quad (1)$$

where  $\Delta Tr$  – percentage change in tax revenues over the analysed period of time;  
 $\Delta GDP$  – percentage change in GDP for the same period.



Table 5 shows the level of influence of macroeconomic indicators of the country's development on the volume of tax revenues of the state budget, which explains the above analysed changes in revenues to the state budget.

**Table 5 The level of influence of macroeconomic indicators of the country's development on tax revenues** (Author's calculations)

Indicators	Years				
	2011	2012	2013	2014	2015
The coefficient of GDP elasticity and tax revenues	1.239	0.519	-1.068	1.418	0.420
The coefficient of elasticity of gold reserves and tax revenues	1.996	0.184	1.081	-0.998	0.349
Elasticity ratio of export and import surplus and tax revenues	-0.540	-0.067	-0.032	0.155	-0.010
Elasticity ratio of public debt and tax revenues	1.029	0.675	-0.536	-0.863	0.314

It is evident from Table 5 that changes in 2011 point to an elastic system of tax payments to the budget. This indicates an increase in tax revenues faster than changes in the volume of gross domestic product, that is, the taxation had little significant potential of the automatic regulator.

GDP and tax revenues are in the polynomial dependence of the 4<sup>th</sup> level:  $y = -0.5207x^4 + 6.0304x^3 - 23.598x^2 + 35.673x - 16.345$ , at which the accuracy of the approximation ( $R^2$ ) is equal to 1,0. The dependence of foreign exchange reserves and tax revenues is polynomial of 4<sup>th</sup> level:  $y = 0.5036x^4 - 5.9838x^3 + 24.666x^2 - 41.479x + 24.289$ , and the accuracy of approximation ( $R^2$ ) is 1.0. The dependence of the balance of export and import of goods and tax revenues is polynomial of 4<sup>th</sup> level:  $y = -0.0456x^4 + 0.5542x^3 - 2.4044x^2 + 4.4908x - 3.195$  (accuracy of approximation ( $R^2$ ) - 1,0). The level of public debt and revenue is in the polynomial dependence of the 4<sup>th</sup> level:  $y = -0.0467x^4 + 0.7573x^3 - 3.8043x^2 + 6.4588x - 2.336$ ,  $R^2 - 1.0$ .

Let us display the influence of the growth rate of GDP ( $x_1$ ) public debt ( $x_2$ ), the balance of exports and imports ( $x_3$ ) and the volume of reserves ( $x_4$ ) in tax revenues ( $y$ ) by using multiple regression statistical method. As a result of the calculations, an equation is obtained:

$$y = -7.137 + 2.638x_1 - 0.356x_2 + 0.005x_3 - 0.01x_4.$$

From the equation, it can be seen that the plane inclination towards the rate of GDP growth (+2.638) represents the positive sensitivity of tax revenues to changes in GDP growth, and the plane inclination in the direction of changes in public debt (-0.356) represents a negative sensitivity of tax revenues. This

indicates that with an increase in the GDP growth rate and the balance of export and import of goods, tax revenues should increase, with a decrease in the level of government debt and the volume of gold and foreign exchange reserves, tax revenues should decrease.

## **Conclusions**

According to the results of the research study, it can be concluded that tax revenues to the state budget in market conditions are a prerequisite for the state to fulfil its functions and the main structure-generating component of the revenue side of the budgets. Tax revenues to the state budget are a coherent interaction of all elements of the system, the functioning of which characterizes the state, the development of the tax system in general, the change in dynamics under the influence of external factors.

There was a strong correlation between gross domestic product, public debt, balance of export and import of goods, volume of gold and foreign exchange reserves and total volume of tax revenues. This share of GDP, which formed the tax revenues of the state budget and was the result of the distribution of the value of GDP between economic entities (or subjects of the economy), was mobilized almost unchanged in the budget - in the considered time interval its polynomial extrapolation took place. In 2010 – 2015, there were changes in the elasticity of tax revenues relative to the macroeconomic indicators of the development of Poland.

Budget revenues are modelled depending on: 1) the dynamics of macroeconomic indicators; 2) changes in tax rates; 3) changes in privileges for payment of a certain tax due to changes in tax legislation; 4) the quality of tax administration. The degree of disaggregation of tax revenues depends on the availability of relevant data, the separation of relevant tax bases and their structure for the allocation of the main categories of taxes. Proceeding from the fact that the main tax categories often relate to the bases covering most of the economic activity, trends can be used to address certain issues related to budget revenue planning and to find alternative or settlement bases among the variables of national accounts and balance of payments. It is also possible to apply a consistent procedure when considering the implications for tax revenues due to the different choice of tax bases to ensure appropriate scenario interaction between macroeconomic variables.

Prospects for further research. In the process of budget forecasting and modelling it is necessary to take into account the levels of inflation, the rate of national currency and labour migration. Therefore, in the future it is expedient to study the relationship between the above indicators and tax revenues of the country.

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